Appendix C

Engineering Design File for the Soil Minimization Strategy

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Engineering Design File

WAG 5 OU 5-12 Phase II Remedial Action Soil Volume Minimization Strategy

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1. Project File No. OU 5-12 Phase II 2. Project/Task WAG 5 OU 5-12 Phase II Remedial Action

3. Subtask Contaminated Soils Removal Preliminary Design

4. Title: WAG 5 OU 5-12 Phase II Remedial Action Soil Volume Minimization Strategy

5. Summary: A large volume, approximately 51,432 cubic yards, of contaminated soil and rocks at five CERCLA sites in the ARA and PBF areas have been identified for removal and subsequent disposal at the proposed ICDF. Specifically, these sites are: the ARA-I Chemical Evaporation Pond (ARA-01), the ARA-III Radioactive Waste Leach Pond (ARA-12), ARA-I and ARA-II Radiologically Contaminated Soils (ARA-23), ARA-I Soils Beneath the ARA-626 Hot Cells (ARA-25), and the SPERT-II Leach Pond (PBF-16). The WAG-5 project team has identified methods that may be employed to minimize the volume of soil that will be disposed of at the ICDF; thereby minimizing the amount of clean soil, soil with contaminant concentrations less than the remedial action goals, that is excavated and dispositioned at ICDF. The volume minimization methods include 1) procurement approach 2) utilization of site characterization data, 3) optimization of field technologies and excavation methods, and 4) handling and dispositioning of large rocks. The strategy will be flexible enough to incorporate new technologies for field measurements and excavation methods that may arise between now and the time the remedial action begins in 2004.

6. Distribution (complete package):

Distribution (summary package only):

7. Review (R) and Approval (A) Signatures: (Minimum reviews and approvals are listed. Additional reviews/approvals may be added as necessary.)

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ACRONYMS

ARA	Auxiliary Reactor Area
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
D&D	decontamination and dismantlement
DOE-ID	U.S. Department of Energy Idaho Operations Office
GPRS	Global Positioning Radiometric Scanner
HPGe	high-purity germanium
ICDF	INEEL CERCLA Disposal Facility
INEEL	Idaho National Engineering and Environmental Laboratory
OU	operable unit
PBF	Power Burst Facility
RCRA	Resource Conservation and Recovery Act
RD/RA	remedial design/remedial action
RFI	Request for Information
ROD	record of decision
SPERT-II	Special Power Excursion Reactor Test No. 2
VE	value engineering
WAG	waste area group
XRF	x-ray fluorescence

WAG 5 OU 5-12 PHASE II REMEDIAL ACTION SOIL VOLUME MINIMIZATION STRATEGY

1. ISSUE

A large volume, estimated at 39,298 m^3 (51,432 yd^3), of contaminated soil and rocks at five Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites in the Auxiliary Reactor Area (ARA) and Power Burst Facility (PBF) areas have been identified for removal and subsequent disposal at the proposed Idaho National Engineering and Environmental Laboratory (INEEL) CERCLA Disposal Facility (ICDF) or other on-Site disposal facility. Specifically, these sites are: the ARA-I Chemical Evaporation Pond (ARA-01), the ARA-III Radioactive Waste Leach Pond (ARA-12), ARA-I and ARA-II Radiologically Contaminated Soils (ARA-23), ARA-I Soils Beneath the ARA-626 Hot Cells (ARA-25), and the Special Power Excursion Reactor Test No. 2 (SPERT-II) Leach Pond (PBF-16).

The Waste Area Group (WAG) 5 team identified early in the remedial design/remedial action (RD/RA) process that the amount of soil requiring disposal must be minimized in order to minimize costs and reduce the total volume of soils disposed at the ICDF or other on-Site disposal facility. Additionally, the State of Idaho Department of Health and Welfare, Division of Environmental Quality noted with the signature of the Record of Decision (ROD) that U.S. Department of Energy (DOE-ID) minimize the volume of soils from ARA-23 that are sent to ICDF or other on-Site disposal facility. Therefore, the RD/RA process for the five contaminated soil sites addressed in the Operable Unit (OU) 5-12 ROD will incorporate methods, as discussed below, for minimizing the amount of soil material requiring disposal.

2. BACKGROUND AND ASSUMPTIONS

The OU 5-12 remedial investigation and baseline risk assessment identified contaminants that pose unacceptable human health and/or ecological risks at the five CERCLA sites in the ARA and PBF areas. The estimated volumes of contaminated soils for each site are based on conservative assumptions. The following table lists the contaminants of concern for each site, the respective remedial action goals, and the estimated soil volume identified in the OU 5-12 ROD (DOE-ID 2000a).

Table 2-1. Operable Unit 5-12 contaminated soil sites.

Site	Contaminant of Concern	Remedial Action Goal	Estimated Contaminated Soil Volume (m^3)	(yd^3)
ARA-01	Arsenic	10 mg/kg		2,382
	Selenium	2.2 mg/kg		
	Thallium	4.3 mg/kg	1,821	
ARA-12	Ag-108m	0.75 pCi/g		1,998
	Copper	220 mg/kg		
	Mercury	0.5 mg/kg		
	Selenium	2.2 mg/kg	1,503	
ARA-23	Cs-137	23 pCi/g	35,538	46,481
ARA-25	Arsenic	5.8 mg/kg		71
	Cs-137	3 pCi/g		
	Ra-226	1.2 pCi/g		
	Copper	220 mg/kg		
	Lead	400 mg/kg	54	
PBF-16	Mercury	0.5 mg/kg	382	500
TOTAL VOLUME			39,298	51,432

As discussed in the main text of the OU 5-12 Phase II work plan (DOE-ID 2000b), there is a distinct possibility that at least a portion, if not all, of the ARA-25 site remediation will occur as part of the OU 5-12 Phase I activities (DOE-ID 2000c). This is attributed to the stainless steel piping associated with the ARA-16 Radionuclide Tank remediation, conducted under Phase I, intersecting the concrete foundation walls and soils associated with ARA-25. It may be in the best interest of the project to continue with the remediation of ARA-25 to the point of completion.

The remediation of PBF-16 was included in the ROD (DOE-ID 2000a) based on the fact that a single analytical sample indicated the presence of mercury at levels that posed an unacceptable ecological risk. An attempt was made to better define the extent of mercury contamination at the site through a sampling effort during June 2000 (INEEL 2000a). The results of this sampling indicate that mercury concentrations in the pond area are below the remedial action goal of 0.5 mg/kg. Therefore, this site is no longer considered to pose an unacceptable risk, and no remediation is required (INEEL 2000b).

3. VOLUME MINIMIZATION STRATEGY

3.1 Overview

An estimated total volume of 39,323 m^3 (51,432 yd^3) of contaminated soil will require removal and subsequent disposal at the ICDF, with the soils from ARA-23 comprising 90% of the total volume. The WAG 5 project team has identified methods that may be employed to minimize the volume of soil that will be disposed, thereby minimizing the amount of soil with contaminant concentrations less than the remedial action goals that is excavated and dispositioned at the ICDF or other on-Site disposal facility. The 4 elements of the volume minimization strategy include: (1) procurement approach, (2) utilization of site characterization data, (3) optimization of field technologies and excavation methods, and (4) handling and dispositioning of large rocks. The strategy will be flexible enough to incorporate new technologies for field measurements and excavation methods that may arise between now and the time the remedial action begins in 2004.

3.2 Procurement Approach

The objective of this method is to define and develop a procurement approach and contract structure that provides for minimization of soil volume. Typically, a contract is awarded on the volume of soil removed. In this case, the reward should reflect removing the minimum amount of soil for disposal. The preferred procurement strategy will include a clear description of the work to be performed, a process to minimize the soil removal, a request for input from the contracting community, and a pre-bid walk through. A value engineering session was held March 8, 2000, to discuss the soil minimization strategies and to formulate a procurement approach for the WAG 5 Phase II remedial action. The following is a partial list of the procurement items addressed during the value engineering (VE) session:

- Develop white paper stating the objectives of the work
- Define a "how-to" process (excavation plan) to minimize the soil removed
- Determine Davis-Bacon/Make-Buy decision
- Issue the Request for Information (RFI), asking for contractor input on minimizing the volume removed
- Perform a pre-bid walk through and data review with the contractors
- Identify acceptable and excluded equipment
- Produce List of Unknowns
- Define how the quantity of soil removed will be measured
- Define what work, if any, will be performed in-house
- Handle vegetation
- Handle large rocks
- Define equipment needs

- Define required contractor capabilities
- Complete a boiler-plate procurement package by 12/2000
- Define the excavation and field screening sequence between the sites
- Evaluate hot spots after contractor removes three inches of soil.

Five strategies for contracting the excavation were presented and discussed during the VE session. The conclusions of the meeting resulted in a Contractor Package Approach. The preferred approach would be to bid as separate line items: (1) the removal of the top three inches of soil, and (2) the remediation of the hot spots that were detected after the initial excavation. Considerations must be made for standby and downtime, as well as working conditions if the soil is too wet or too dry. Sequencing of the excavations to optimize the use of equipment and resources will be finalized at a later date; however, a proposed sequence is presented below in Section 3.10.

3.3 Soil Removal Approach

As stated earlier, approximately 90% of the estimated WAG 5 soil volume is located at ARA-23; however, the opportunity exists at all of the contaminated soil sites for minimizing the amount of clean soil that is excavated and disposed at the ICDF or other on-Site disposal facility. As stated previously, the remediation of ARA-25 will be conducted under the OU 5-12 remediation of ARA-16, and PBF-16 will not require remediation. A generic approach for contaminated soil removal is to use existing characterization data to define the lateral and vertical bounds of the initial excavation at each site. The area to be excavated will be surveyed and marked, and vegetation will be mowed, removed and dispositioned with the soils. Excavation of soils will proceed using the appropriate equipment, most likely an all-wheel drive motor grader. Although most of the contamination in the soil resides in the top 2.5 cm (1 in.) (i.e. Cs-137 at ARA-23), limitations in the equipment and the uneven terrain make it necessary to remove the top 7.6 cm (3 in.). Field screening methods may then be employed to identify any remaining hot spot contamination. Depending upon the size of the hot spot(s), appropriate equipment such as a front-end loader, backhoe, or hand shovel may be used to remove the contaminated material. Field screening methods will again be employed to verify hot spot removal. An iterative process of excavation followed by field screening will be used to selectively remove only contaminated soil that exceeds the remedial action goal(s). The nature and extent of contamination for each contaminant of concern varies for each site; therefore, the number of iterations of hot spot identification and selective excavation may also vary by site. Upon completion of the excavations, final surveys and verification sampling will occur to demonstrate that the site is clean and the remedial action goals have been achieved. Due to the shallow distribution of the surface soils in some locations, the basalt may be exposed. If residual contamination above the remedial action goals remains on the basalt, simplistic methods will be employed (i.e., vacuuming, sweeping) to remove the contamination from the surface or near-surface interstices of the basalt. If decontamination efforts are unsuccessful, then appropriate institutional controls will be implemented at any site where COCs remain at levels that prevent unrestricted and unlimited use of the site.

A brief discussion is warranted of the role of field screening compared to the final closure survey. Field screening will be used to make decisions in the field as to whether or not further excavation is warranted (i.e., hot spot contamination). Typically, final status (i.e., the site is clean) will be based on confirmation samples and final status survey data. To the extent practical, in-situ field measurements will be used to support the final status decision for each site. The proposed soil removal process, field screening methods and final status surveys for each site are outlined in the following sections. The field screening methods and instrumentation discussed in the following sections refer to state-of-the-art technologies that are currently in use at the INEEL; however, if more sensitive, versatile, and accurate technologies become available by 2004, they will be evaluated against the project objectives. If the new instrumentation meets project objectives, then it will be incorporated into the field screening and final status surveys.

3.4 ARA-01

The ARA-01 Chemical Evaporation Pond will be remediated to address the risk to human and ecological receptors posed by contaminated soil. The ARA-01 site, shown in Figure 3-1, is a shallow, unlined surface impoundment, roughly 30.5 × 91.4 m (100 × 300 ft), that was used from 1970 to 1988 to dispose laboratory wastewater from the ARA-I Shop and Maintenance building (ARA-627). Process wastes contained small quantities of radioactive substances, acids, bases, and volatile organic compounds. Surface sediments in the pond area are shallow, with a maximum thickness of 1 m (3.5 ft) and an average thickness of 0.5 m (1.5 ft). Laterally, the contamination is contained within the bounds of the pond area. Vertically, the contamination is limited to the surficial sediments as evidenced by the results of borehole logging and soil sample analyses (DOE-ID 2000). As shown in Table 2-1, the contaminants retained during the risk assessment are arsenic, selenium, and thallium, with the highest concentrations found adjacent to the pond inlet in the northern corner of the pond.

The initial removal of soil at ARA-01 will involve excavating the top 7.6 cm (3 in.) over the entire pond surface. Field screening samples will then be collected from the newly exposed soil in the pond area based on a systematic grid to identify potential hot spots. Based on historical and characterization data, hot spots are anticipated near the pond inlet where contamination could extend to the soil/basalt interface; therefore, biased samples will also be taken adjacent to the pond inlet. All samples will be analyzed for arsenic, selenium, and thallium using an onsite, laboratory-grade, x-ray fluorescence (XRF) spectrometer. Method detection limits of the XRF spectrometer for arsenic, selenium, and thallium are, respectively, 0.6, 0.6, and 1.7 mg/kg. Based on the results of the field screening samples, further excavation will be performed in the identified hot spots until all contamination above the remedial action goals is removed, as demonstrated by field screening measurements, or until the basalt interface is exposed. Final status survey samples will then be collected from the area on a random grid to demonstrate, with 90% confidence, that the ARA-01 pond area soils do not contain residual contamination at or above the remedial action goals.

3.5 ARA-12

Remedial action is required for the ARA-12 Radioactive Waste Leach Pond to address the risk to human and ecological receptors posed by contaminated soil. The ARA-12 site, shown in Figure 3-2, is a shallow, unlined surface impoundment approximately 50 × 115 m (164 × 377 ft). Surface sediments are relatively shallow in the pond area, with an estimated average depth of 2.1 m (7 ft). The leach pond received low-level radioactive effluent from the reactor research operations at the ARA-III facility from 1959 to 1965. Investigations at the site show elevated levels of Ag-108m, copper, mercury, and selenium that pose unacceptable risk to future residents and ecological receptors. Silver-108m is the only contaminant of concern that poses a human health risk, while the copper, mercury and selenium pose ecological risks. The lateral extent of the Ag-108m contamination at 0.75 pCi/g and greater is depicted by the shaded area in Figure 3-2. A gross gamma radiological survey performed in 1999 shows the relative levels of radioactivity in the pond soils, as illustrated in Figure 3-3. Historical data also shows that Ag-108m concentrations exceeding the remedial action goals may extend to the soil/basalt interface in the vicinity of the pond inlet; however, the accuracy of that data is questionable. Review of the Track 2 study data shows that the elevated copper, mercury, and selenium contamination is confined to the surficial soils 0 to 0.15 m (0 to 0.5 ft.) near the pipe inlet and in the pond ditch corresponding to the area of elevated radioactivity in the northeast portion of the pond as shown in Figure 3-3. Additionally,

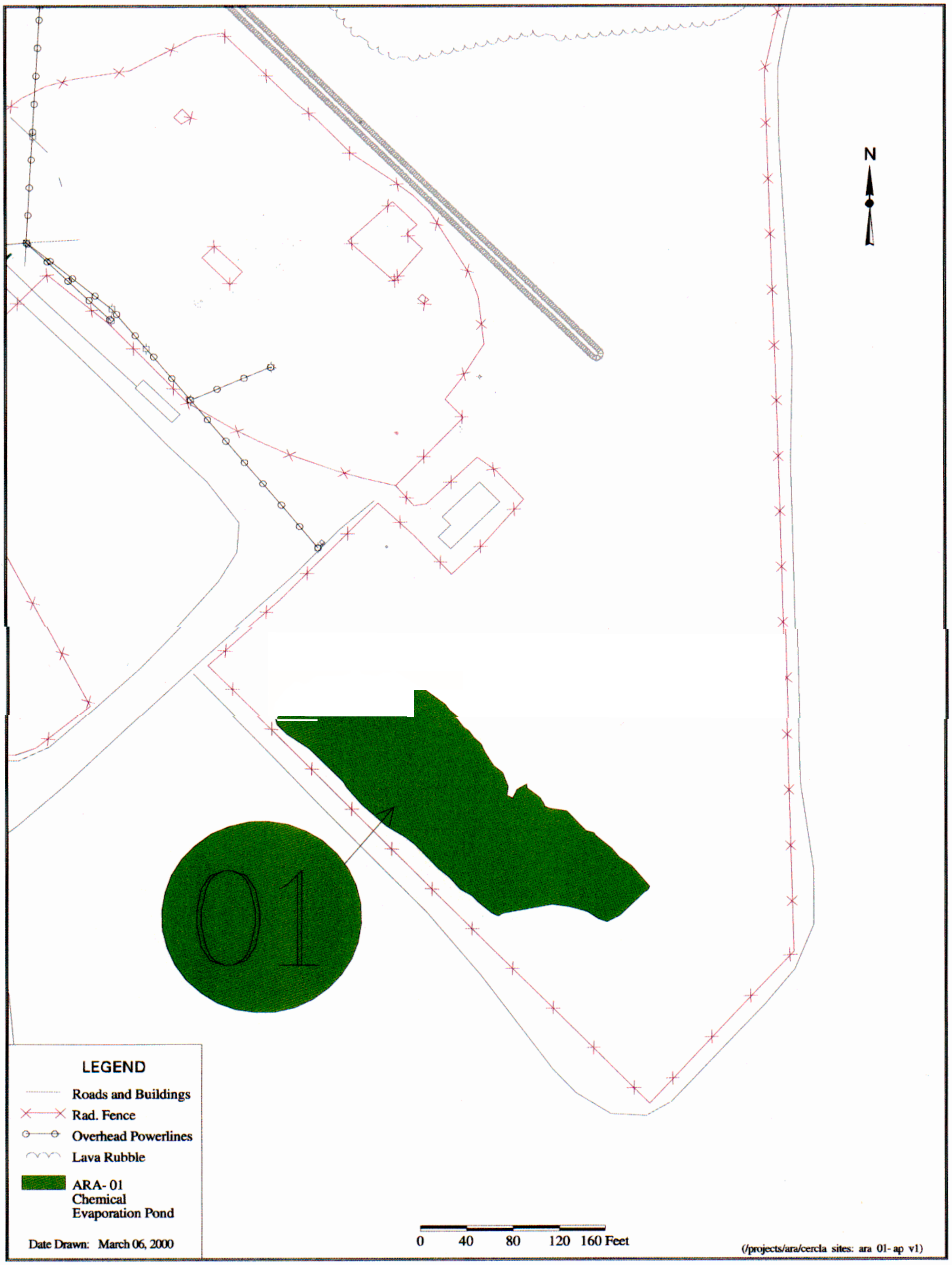

Figure 3-1. ARA-01 site, estimated lateral extent of contamination.

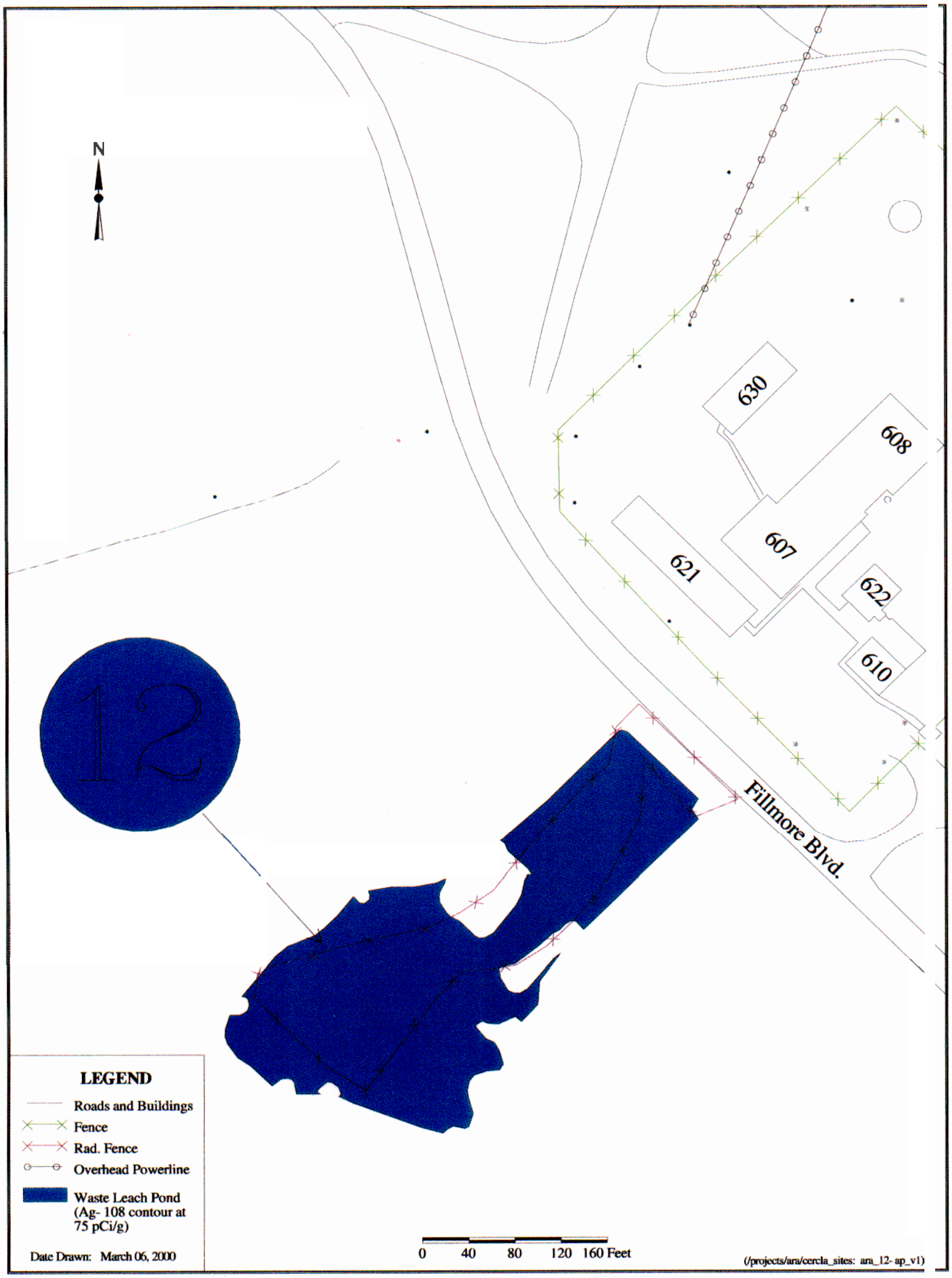

Figure 3-2. ARA-12 site, estimated lateral extent of Ag-108m contamination.

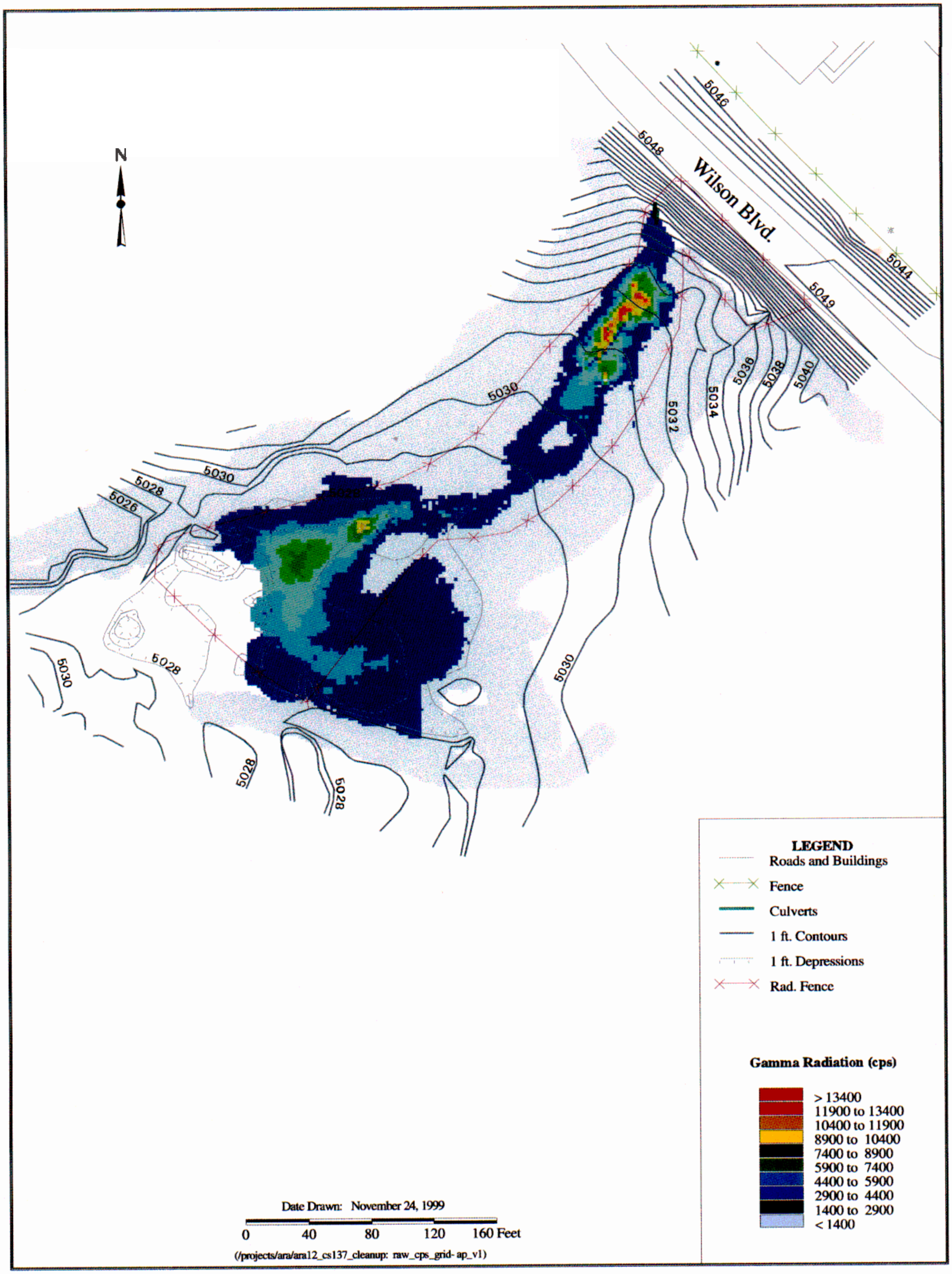

Figure 3-3. ARA-12 gross gamma radiological survey.

selenium at 2.7 mg/kg was identified from 0.76 to 0.9 m (2.5 to 3 ft) at a single location on the east bank of the pond area; however, based on data qualifier flags, this value may not be accurate.

The initial removal of soil at ARA-12 will involve excavating the top 3 in. over the entire area defined in Figure 3-2. An additional 7.6 cm (3 in.) will be removed from the hot spot in the northeastern portion of the pond (see Figure 3-3), an area roughly 6 × 20 m (20 × 65 ft). Field screening methods will then be used to identify any remaining hot spots. The excavated area will be surveyed with the Global Positioning Radiometric Scanner (GPRS) to identify radiological hot spots. The GPRS is comprised of two large area plastic radiation detectors and a global positioning system mounted on a four-wheel drive all-terrain vehicle. The vehicle is driven at a rate no greater than 5 mph, and the computer controlled data acquisition system collects radiation readings in counts per second along with the associated position. This system provides 100% coverage of the surveyed area to ensure that no hot spots above the remedial action goal are missed. The GRPS survey will also be used for identifying potential locations of elevated copper, mercury and selenium. Due to the nature of the contaminant deposition, it is assumed, and supported by analytical data, that the copper, mercury and selenium are co-located with the radiological contamination in the upper 0.15 m (0.5 ft.) of the surficial soils. If a hot spot is identified with the GPRS, then a stationary measurement with a tripod-mounted high-purity germanium (HPGe) spectrometer will be used to positively identify and quantify the contamination contributing to the elevated radiation levels. Additionally, a field screening sample will be collected at the center of the hot spot and analyzed for copper and selenium using the laboratory XRF spectrometer. Samples will also be collected from a systematic grid and analyzed for copper and selenium to identify any other areas of elevated metal contamination not identified via the GPRS. Method detection limits for the XRF spectrometer are 0.9 and 0.6 mg/kg for copper and selenium, respectively. The radiological data from the GPRS, and the copper and selenium data from the XRF will be used to direct excavation of hot spots. If field screening shows Ag-108m, copper, or selenium above the remedial action goals, then additional excavations will be performed. Based on the results of the field screening, excavation will be performed in the identified hot spots until all contamination above the remedial action goals is removed, as demonstrated by field screening measurements, or until the basalt interface is exposed. Based on the information presented here, if 15 cm (6 in.) or more soil are excavated at ARA-12, then all copper, mercury and selenium contamination should be removed; however, confirmation sampling for final site closure will provide the final verification. Final status survey samples will then be collected from the area on a random grid to demonstrate, with 90% confidence that the ARA-12 pond area soils do not contain residual contamination at or above the remedial action goals.

3.6 ARA-23

Remedial action is required for the ARA-23 radiologically contaminated soils to address the risk to human health posed by the Cs-137 contamination in the soils. Investigations at the site show that Cs-137 is the only contaminant that poses an unacceptable risk to hypothetical, future residents. ARA-23 is a 42 acre, windblown, contamination area surrounding the ARA-I and ARA-II facilities, as shown in Figure 3-4. The surface sediments vary in thickness across ARA-23, but are generally shallow (<6 m [<20 ft]). The soil was contaminated by the 1961 SL-1 accident and subsequent cleanup. Over time, winds dispersed the contamination over an area roughly 240 acres in size. Investigations at the site show that most of the Cs-137 contamination is limited to the top 2.5 cm (1 in.) of soil. Figure 3-5 shows the extent of Cs-137 contamination greater than or equal to 20 pCi/g. A small portion, 0.9 acres, of the area is covered with large basalt rocks. These rocks were determined to be contaminated above the 23 pCi/g remedial action goal; however, it is generally accepted that the contamination on the rocks is actually associated with the soil that partially covers the rocks. Dispositioning of the rocks is covered below in Section 3.9.

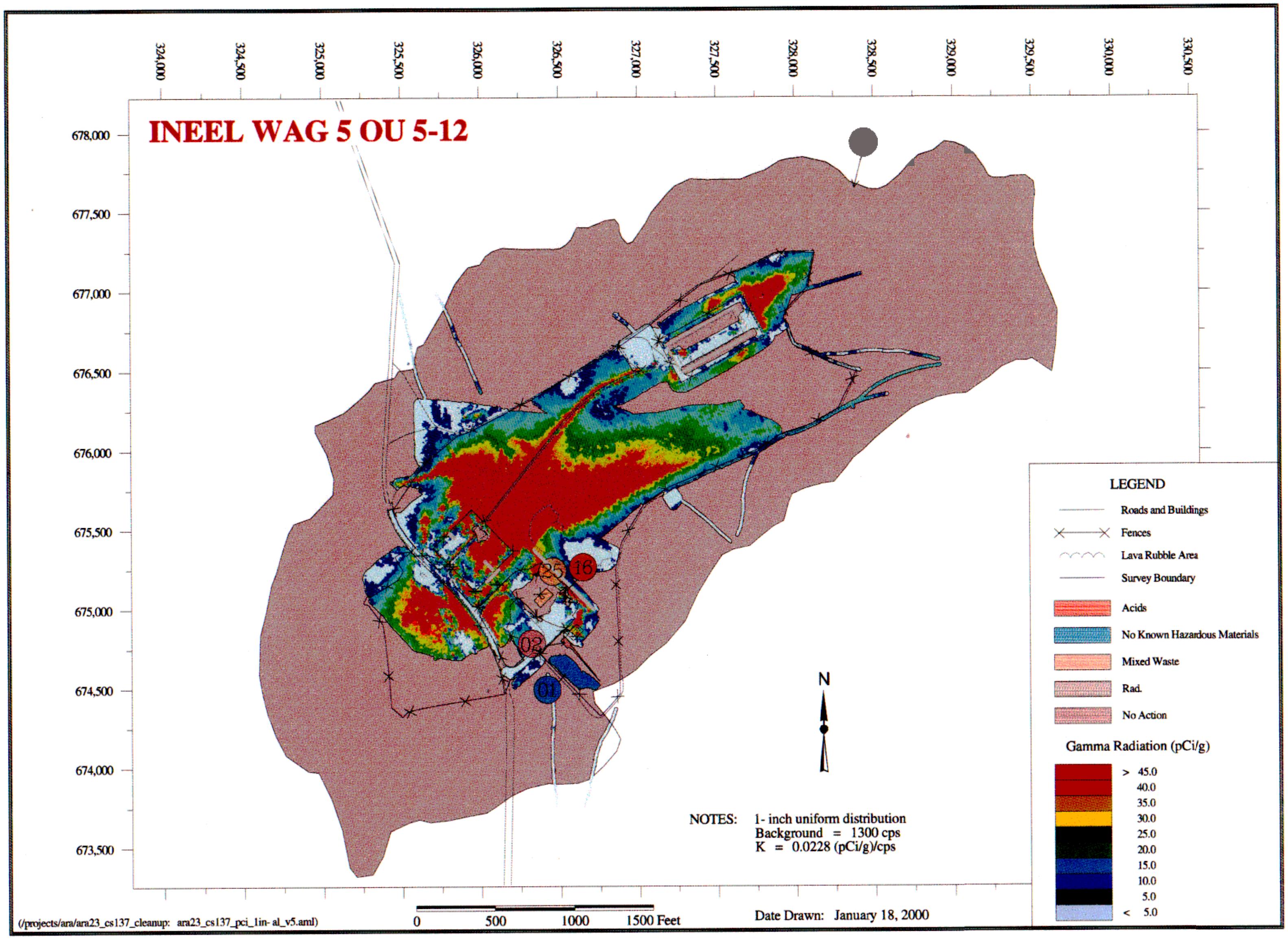

Figure 3-4. ARA-23 site, estimated lateral extent of windblown contamination, and Cs-137 concentrations.

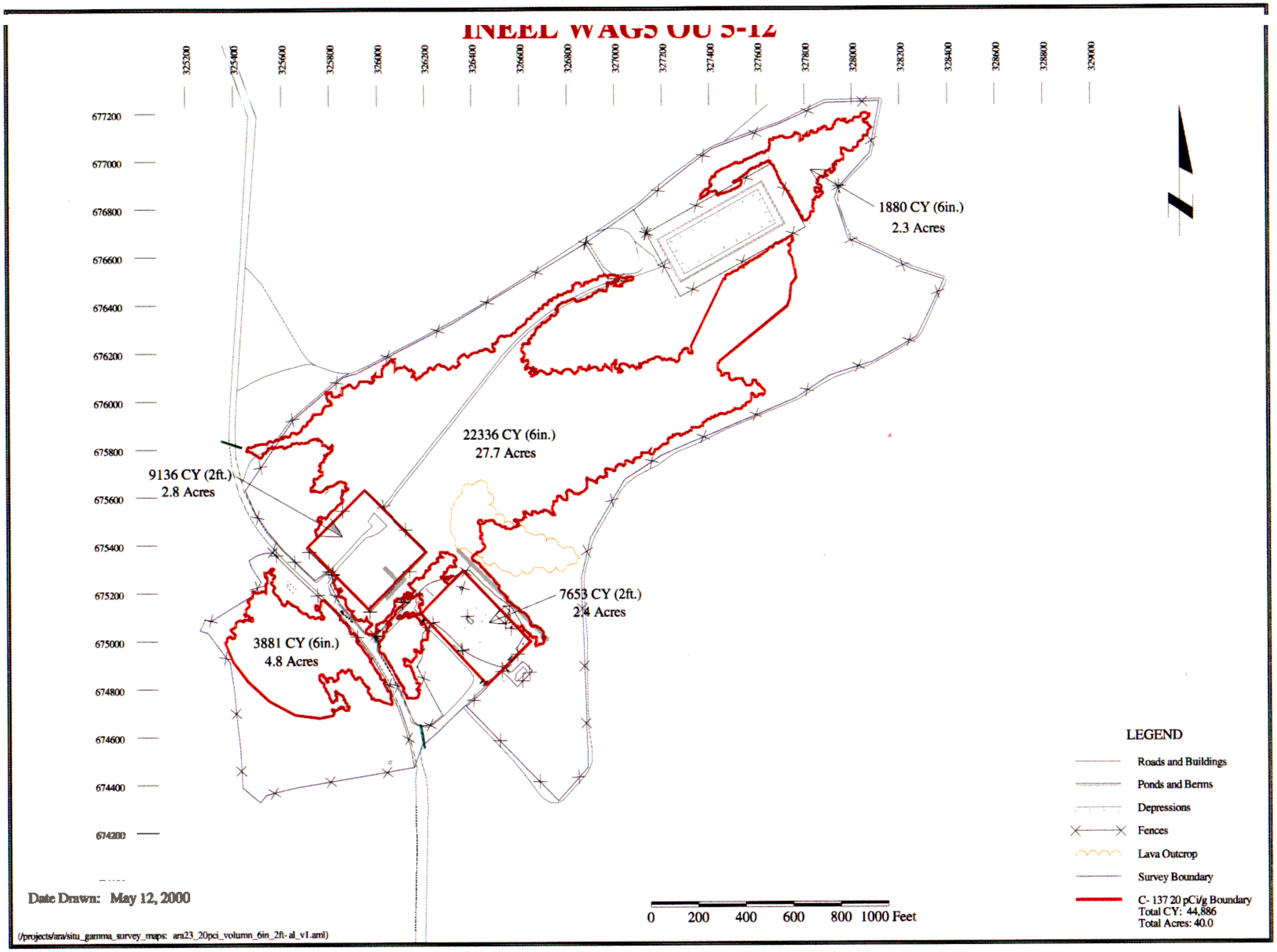

Figure 3-5. 20 pCi/g isopleth at ARA-23, and estimated excavation volumes.

The initial removal of soil at ARA-23 will involve excavating the top 7.6 cm (3 in.) over the entire area defined by the Cs-137 20 pCi/g isopleth in Figure 3-5. Exceptions to this include the SL-1 haul road corridor and turn-around area, and inside the fences of the ARA-I and ARA-II facilities. The initial excavation of the SL-1 haul road corridor and turn-around area, and the ARA-II facility will remove the top 15 cm (6 in.) of contaminated soil. Initial soil removal inside the ARA-I facility will involve excavation and stockpiling of the top 15 cm (6 in.) of soil. This soil will then be surveyed with hand-held sodium-iodide detectors, or other comparable field instrument, to evaluate whether or not they exceed the 23 pCi/g remedial action goal, and then dispositioned accordingly. Contaminated soils will be sent to ICDF, and soils below 23 pCi/g will be used for backfill. The excavated areas will then be surveyed with the GPRS to identify remaining hot spots. The hot spots will then be measured with the above ground HPGe spectrometer to positively identify and quantify the remaining Cs-137 contamination. Additionally, estimates of the depth distribution of the remaining contamination will be made from the HPGe measurements. This will assist the field personnel in determining how deep to make the next cut of soil. The removal and field screening process at ARA-23 may require multiple iterations before the remedial action goal of 23 pCi/g is achieved. Use of field screening instrumentation will minimize the number of iterations, and increase the efficiency of the removal by positively identifying the depth of residual hot spot contamination, and directing the aerial and vertical extent of hot spot removal. Due to the vast expanse of the site, and the comprehensive nature of the radiological field screening methods, the number of soil samples collected will be minimized by using GPRS data to support the final status survey. Final status survey measurements and a limited number of verification samples will then be collected from the area on a random grid to demonstrate, with 90% confidence that ARA-23 area soils do not contain residual contamination at or above the remedial action goals.

3.7 ARA-25

The ARA-25 site, ARA-I Soil Beneath the ARA-626 Hot Cells, will be remediated to address the risk to human and ecological receptors posed by contaminated soil. The ARA-25 site comprises contaminated soil that was discovered beneath the ARA-626 hot cells during the decontamination and decommissioning (D&D) of the ARA-I facility in 1998. Figure 3-6 shows the location of the ARA-25 soils. The ARA-I hot cells were constructed in 1959 and used until the facility was shut down in 1988. Liquid, radioactive waste from the hot cells, in addition to chemicals from materials testing and research and metal-etching processes were disposed through the hot cell drains. Stainless steel piping connected the floor drains with the ARA-729 Radionuclide Tank (CERCLA Site ARA-16). Analyses of soil samples collected in 1998 underneath the hot cell floors show that Cs-137, Ra-226, arsenic, copper, and lead are present in concentrations that pose unacceptable risk to human and ecological receptors. The aerial extent of contamination is estimated at 4.8×7.3 m (16×24 ft). The depth to basalt at ARA-25 is approximately 1.5 m (5 ft.), and it is currently assumed that the contamination extends from land surface to the soil/basalt interface.

Due to the limited extent of the ARA-25 site boundaries, there is an estimated total of 54 m^3 (71 yd^3) of material that could be contaminated. The soils at ARA-25 are scheduled to be removed with the stainless steel piping during the WAG 5 Phase I remedial action; however, to minimize the amount of soil that requires disposal, the soil excavation will take advantage of field screening methods. If the ARA-25 soils are dispositioned during the Phase I remedial action, they will be disposed at the RWMC, Envirocare, or other suitable disposal facility. After the piping and contaminated soils have been removed, clean fill will be used to bring the area back to the surrounding grade.

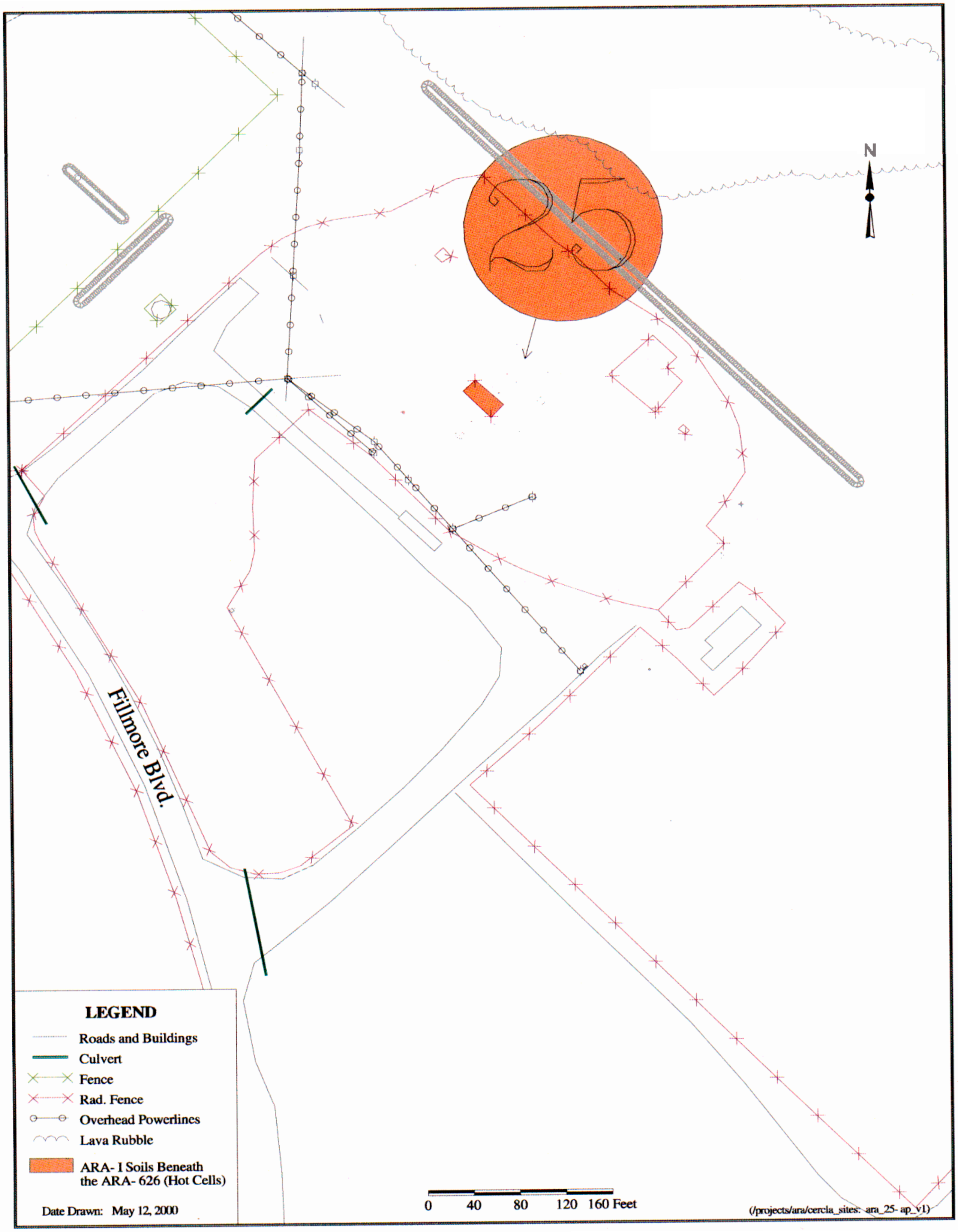

Figure 3-6. ARA-25 site.

3.8 PBF-16

Initially, remedial action was required for the PBF-16 SPERT-II Leach Pond to address the risk to ecological receptors posed by low levels of mercury contamination. The PBF SPERT-II Leach Pond (PBF-16) is located approximately 91.4 m (300 ft) south of the SPERT-II reactor building (PBF 612) with maximum dimensions of 51 × 70 m (167 × 230 ft). The pond area is surrounded by a six-sided, mesh and barbed wire fence, with a 3 m (10 ft) gate located on the east side, as illustrated in Figure 3-7. The SPERT-II reactor was a low-pressure, heavy water nuclear reactor that operated for five years from 1959 to 1964. The leach pond was used for disposal of demineralizer effluent, water softener waste, emergency shower drain water, and discharges from the floor drains from the reactor building. From 1964 until 1990, the only discharge to the pond was clean water from the PBF maintenance shop air compressor. The pond area was sampled in 1982 and 1983 for radiological and Resource Conservation and Recovery Act (RCRA) hazardous substances, and only mercury was identified as posing an unacceptable risk to ecological receptors.

The sampling in 1983 comprised collecting a single biased sample from the pond area and subsequent analysis for target analyte list metals and organic compounds. This single sample identified mercury at 0.71 mg/kg, which is in excess of the 0.5 mg/kg remedial action goal. Due to the limited mercury data, a post-ROD field sampling event was conducted in June 2000 to characterize the pond area for mercury, and define the extent of mercury contamination at or above the 0.5 mg/kg remedial action goal (INEEL 2000a). As stated previously, the sample analytical results indicate that the concentrations of mercury are below the 0.5 mg/kg remedial action goal (INEEL 2000b).

3.9 Handling of Large Rock and Debris

A potential area for volume reduction and volume minimization will be in the handling of the large rocks at ARA-23 that are presently identified as contaminated with Cs-137 above the 23 pCi/g remedial action goal. There are approximately 2,217m^3 (2,900 yd^3) of contaminated rock at ARA-23; however, it is generally accepted that the contamination associated with the rock is actually in the soil that partially covers and surrounds the rock. An evaluation is currently underway to assess the feasibility of decontaminating the rock as opposed to removal and bulk disposal at the ICDF. Two methods of decontamination will be addressed in the evaluation:

- Gross decontamination by using a front-end loader with a rock bucket to shake the dirt loose from the rocks
- Gross decontamination by using a stiff bristle brush to loosen the soil, and a vacuum to remove the dirt.

The rocks will then be screened using a hand-held sodium iodide detector or other comparable field instrument to verify that the Cs-137 contamination has been removed and that the residual contamination left on the rocks is less than the 23 pCi/g remedial action goal.

The alternative to decontaminating the rock is removal and bulk disposal. If decontamination methods are not feasible, either physically or in terms of cost, then the rock will be removed and disposed at ICDF. The 2,217 m^3 (2,900 yd^3) of rock material comprises only 6% of the total estimated WAG 5 volume. It should be noted that the volume of large rock encountered in the excavation of the other CERCLA sites will be excavated and dispositioned with the soils.

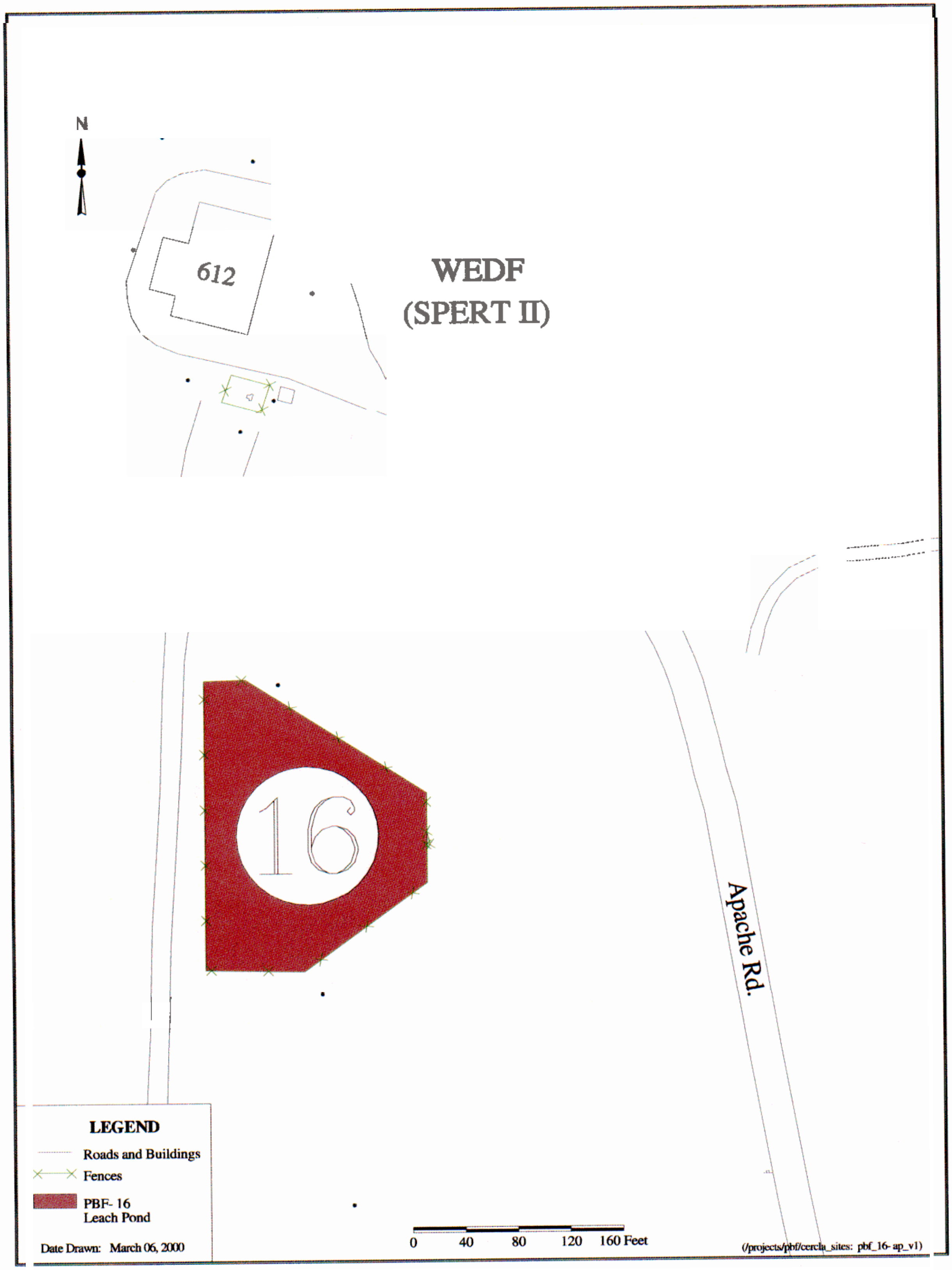

Figure 3-7. PBF-16 leach pond.

3.10 Sequencing of Soil Removal

Sequencing of the soil removal is critical to completing the work scope on schedule, in a timely and efficient manner. Whether the soil removal work is let to a subcontractor, or if it is completed in-house, proper sequencing of the removal is necessary to minimize the amount of idle time. The proposed removal scenario is as follows:

- Mobilize equipment to ARA-01 site.
  - Perform initial excavation and field screening at ARA-01, followed by selective excavation based upon field screening results.
  - Field screening will be performed again to verify that residual contamination is below the remedial action goals, followed by confirmation sampling for the final closure survey.
  - Decontaminate equipment.
- Mobilize to ARA-12 site.
  - Perform initial excavation and field screening at ARA-12, followed by selective excavation based upon field screening results.
  - Field screening will be performed again to verify that residual contamination is below the remedial action goals, followed by confirmation surveying and sampling for the final closure survey.
  - Decontaminate equipment.
- Mobilize to ARA-23.

Excavation and soil removal at ARA-23 will proceed as detailed previously in Section 3.6. The excavation at ARA-23 will also be sequenced due to the large size of the site. The areas encompassed by the ARA-I and ARA-II facility boundaries and the haul road will be treated as separate excavation areas, and the remainder of ARA-23 will be divided into several smaller plots approximately 10 acres in size. Initial excavation of the designated areas within ARA-23 will proceed in a predetermined sequence followed by field screening. Selective excavation will be performed to remove hot spots, followed by additional field screening measurements to verify that residual contamination is below the remedial action goal. The final status survey and confirmation sampling will be performed on each plot at ARA-23 as the excavations are completed. Final survey sample analyses for all WAG 5 CERCLA sites will be performed by an INEEL approved and qualified laboratory.

If analytical results from ARA-01 or ARA-12 are returned while excavation of ARA-23 is ongoing, and it is determined that further excavation is necessary at any one of the sites, then a minimal amount of equipment and manpower will be deployed from ARA-23 to address the excavations at the other sites. It is anticipated, however, that the comprehensive process of excavation and field screening, will eliminate the need to revisit any of the sites after the final status surveys have been performed.

4. PATH FORWARD

The primary objective of the WAG 5 Phase II remedial action is to remove all contaminated material from the five CERCLA sites that exceed the remedial action goals. A constraint on the removal action is to minimize the amount of clean material that is excavated and disposed. An iterative process of selective excavation followed by field screening, special consideration for large rock, and a well defined procurement strategy have been outlined here to provide the framework for meeting the OU 5-12 remedial action objectives. The WAG 5 soil removal, or Phase II of the WAG 5 OU 5-12 remedial action, is not scheduled to occur until 2004, following the opening of the ICDF; therefore, there will be sufficient time and opportunity to continuously evaluate new technologies that may increase the efficiency of the soil removal action. This includes innovative soil removal/excavation methods and field screening technologies.

4.1 Technology Evaluation

The efficiency of the soil removal will be dependant upon several factors including, but not limited to, the accuracy of characterization data, sensitivity and accuracy of field screening technologies, and the method of soil removal that is employed. Currently, performance testing and characterization of the GPRS and the above ground HPGe gamma-ray spectrometer is scheduled to be conducted during the Summer of 2000. These measurement systems will be calibrated and characterized to optimize their use in support of the soil removal action. However, continuous evaluation of technologies applicable to field screening for toxic metals and radionuclides should be performed to ensure the highest levels of precision and accuracy are achieved during the excavation, field screening and final status surveys of the OU 5-12 CERCLA sites.

5. REFERENCES

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